

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE

SEED BRANCH
GEO. H. CLARK, Seed Commissioner

AN INQUIRY
D. W. O. IRRAD

REGARDING THE

HEAT, OATS, BARLEY, FLAX, AND ENSILAGE
CORN USED FOR SEED
IN CANADA

BY

Edgar D. EDDY, B.S.A.

Chief Seed Inspector.

BULLETIN No. 59

Published by authority of Hon. MARTIN BURRELL, Minister of Agriculture, Ottawa, Ont
JANUARY, 1915

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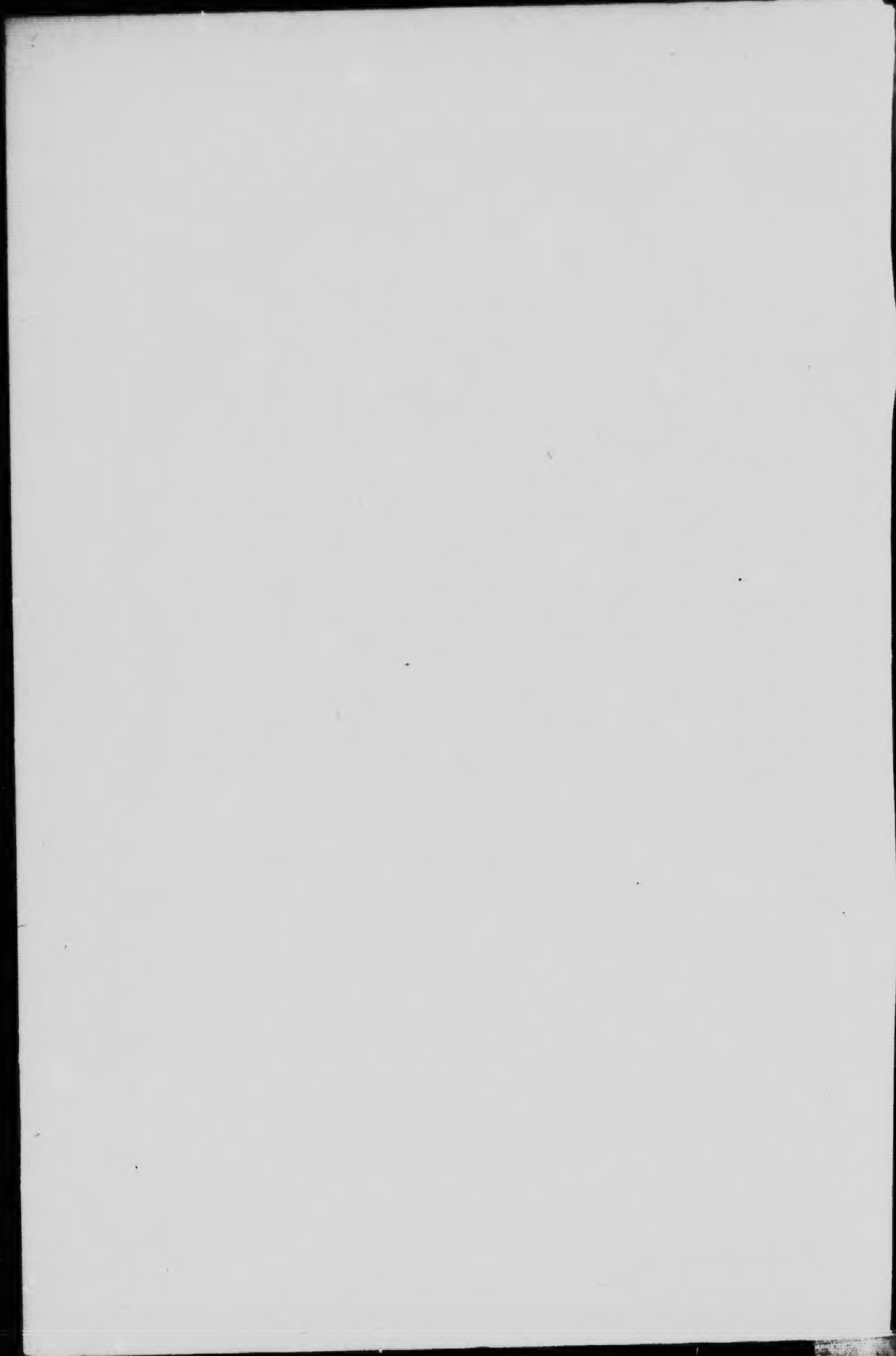
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DEPARTMENT OF AGRICULTURE.
OFFICE OF SEED COMMISSIONER.

OTTAWA, January 7, 1915.

To the Honourable MARTIN BURRELL,
Minister of Agriculture,
Ottawa.

SIR,—I have the honour to submit for your approval a report of an inquiry into the quality of the seed wheat, oats, barley, flax and ensilage corn used by farmers. The main object of this inquiry was to ascertain the common practices of farmers in representative localities in each of the provinces. The data obtained is interesting and even surprising. It serves to measure the progress made as the result of education and legislation and shows the necessity for further aggressive activities with a view to make it easy and attractive for farmers to do the wise thing and difficult for them to do the thing which is opposed to the best interests of themselves and the community.

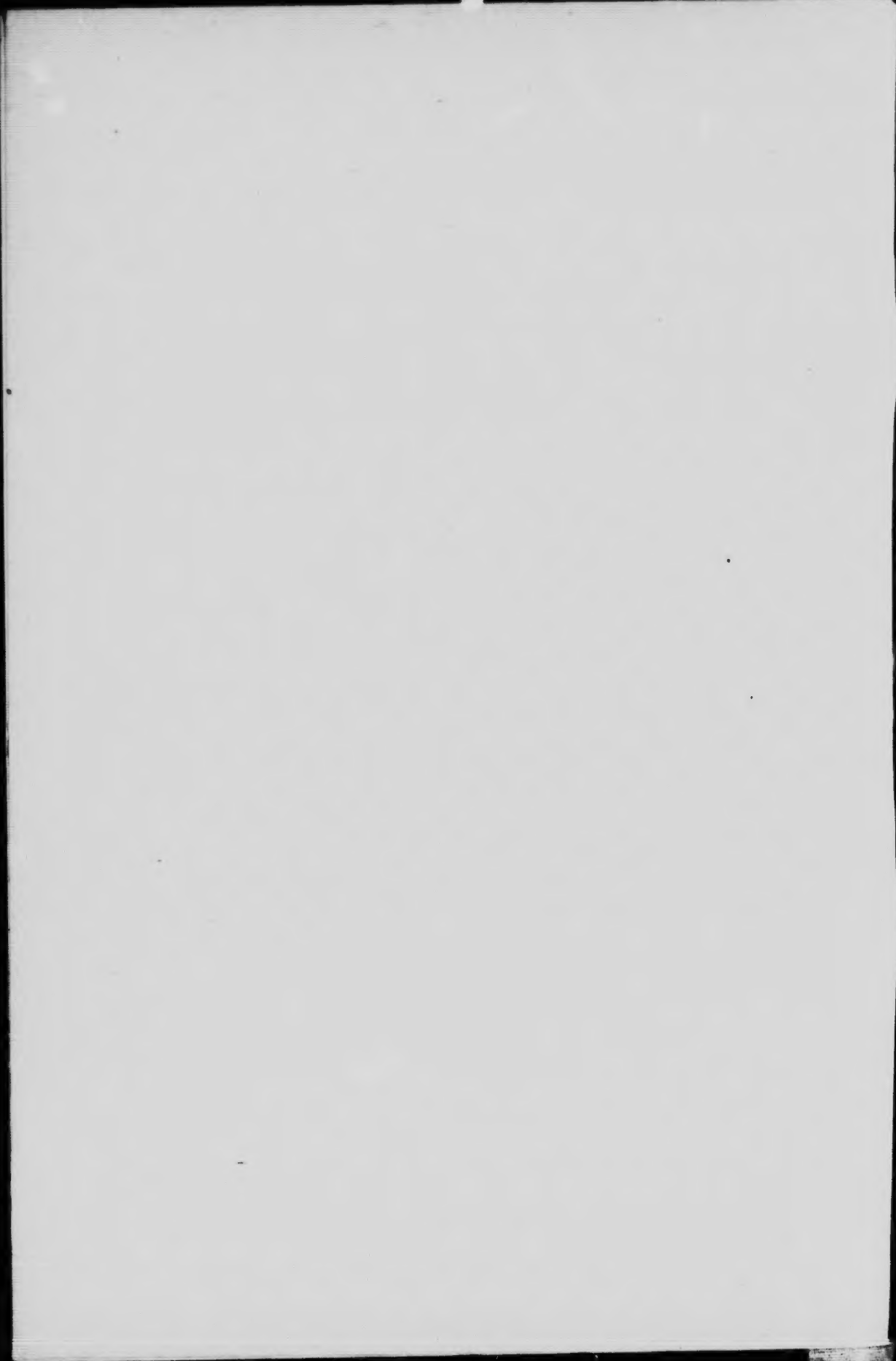
There is no warrant for general condemnation of so-called "indifferent farmers" because of unfortunate conditions revealed by this inquiry. There is much need for serious consideration why the best practices are not more attractive.

It is believed that the information contained herein will make more clear the dangers and losses accruing from the use of inferior seed. I recommend that it be printed for general distribution.

I have the honour to be, Sir,

Your obedient servant,

GEO. H. CLARK,
Seed Commissioner.



AN INQUIRY

REGARDING THE

WHEAT, OATS, BARLEY, FLAX, AND ENSILAGE CORN USED FOR SEED IN CANADA

On its grain crops depend to a great extent the wealth and general prosperity of an agricultural country. Each year the yield and quality of the principal crops are not only of special interest to the farmers but are matters of national concern. It is therefore of the utmost importance that methods be followed that will produce maximum yields of the highest quality.

One of the principal factors toward this end is the use of good seed. In order that land may give the best returns for the cultivation received, it is essential that the seed be clean, strong in vitality, and of a variety or strain suitable to the conditions under which it is to be grown.

With the object of securing definite information in regard to the quality of the seed used on Canadian farms, an inquiry was instituted in the spring of 1913 with wheat, oats, barley and flax, and continued in 1914 with ensilage corn. Seed inspectors were instructed to visit farmers in their respective districts and procure samples of seed actually being put into the ground, together with information in regard to variety, source of supply, treatment for smut prevention, rate of seeding, cleaning and selection. Over 3,700 samples were forwarded to the seed laboratory at Ottawa where they were tested for purity and germination. The aim was to get samples representing the average seed used by farmers. This was done so far as possible but the results are not presented as an accurate record of conditions in detail in the different provinces or districts visited. It is recognized that the number of samples from some provinces is smaller proportionately than from others and that unintentionally inspectors may have occasionally secured extreme rather than representative samples. In some cases, as will be noted in detail later, samples were taken from lots that were yet to be cleaned before seeding, so that the summary of the purity test reports is incorrect to this extent as indicating the impurities that were in the seed when sown.

However, after making full allowance for all inaccuracies, it is clear that the value of the grain crops produced in Canada is enormously lowered each year through the use of poor seed. Surprisingly little attention is paid to choosing the most suitable varieties. The seed is seldom selected or graded, except to pass it through a fanning-mill once or twice, and often not even this is done; in many cases the mills are not equipped with proper sieves and little improvement is effected. Much preventable loss is sustained through failure to treat seed for smut prevention. The number and variety of weed seed and other impurities in a large proportion of the grain and flax insures the introduction of numerous weeds and precludes the possibility of growing even reasonably clean crops which is essential for maximum yields and highest quality.

VARIETIES.

Experiments have repeatedly shown that certain varieties of grain give the largest yields in particular districts. In order to obtain the best results, it is important to study varieties and select those best adapted to the soil and climatic conditions under which they are to be grown. The lack of attention given to selection is indicated by the fact that over forty per cent of the farmers from whom samples of

wheat, oats and barley were collected did not know the variety name of the grain they were growing. In the following tables a list is given of the varieties of different kinds of grain reported from all Canada and by provinces, with an indication of their popularity as shown by the numbers. At the foot of each table is given the number of samples for which the variety name was not known.

VARIETIES OF OATS.

Varieties.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Total number of samples.....	978	51	60	8	158	164	146	224	132	35
Banner.....	264	23	52	3	29	33	65	52	26	1
Abundance.....	101	2			7	7	7	54	24	
Sensation.....	27		3		6	4		1	12	1
Ligowo.....	14	1			2	1	5	1	4	
Old Island Black.....	13	11	2							
Twentieth Century.....	11		1		1	7			2	
Newmarket.....	10	2				2		5	1	
Canadian.....	7				7					
Garton's No. 22.....	6						2	4		
Mammoth Cluster.....	5					5				
Sheffield Standard.....	5					2		1	2	
Storm King.....	5		4			1				
Waverly.....	5				1	2			2	
Irish White.....	4				2	2				
Prince Royal.....	4					4				
Silver Mine.....	4					2			2	
Black Norway.....	3	3					1			
Black Tartarian.....	3	1				1	1			
Russian.....	3						3			
Siberian.....	3					3				
Stirling.....	3					3				
White Jewel.....	3	2				1				
White Cluster.....	3					3				
Dodd's White.....	3					2		1		
Big Four.....	2		2							
Egyptian.....	2	1				1				
Mammoth.....	2				2				1	
Early Cluster.....	2					1				
Swedish Giant.....	2					2				
White Wave.....	2	1				1				
Wideawake.....	2	1						1		
White Giant.....	2					2				
Victory.....	2					1			1	
White Marbie.....	2							2		
Early Blossom.....	1			1						
Danish.....	1				1					
Gold Rain.....	1	1								
Great Dane.....	1		1							
Gloucester.....	1				1					
Joannette.....	1			1						
Irish Victor.....	1					1				
Lincoln.....	1					1				
Minnesota No. 4.....	1					1				
Improved Swedish.....	1							1		
Prospect.....	1								1	
Swedish Select.....	1								1	
Brazilian.....	1						1			
Early English.....	1								1	
Bonanza.....	1								1	
Surprise.....	1					1				
Rosedale.....	1					1				
Thousand Dollar.....	1					1				
Prize Cluster.....	1				1	1				
White Snow Drop.....	1					1				
Blanche D'Ecisse.....	1				1					
Danish Island.....	1	1								
Mixed.....	10				4	6				
Variety not known.....	417	1	15	3	93	58	62	100	52	33

Several samples of oats were reported under names which may indicate the source of the seed but have no meaning so far as variety is concerned, such as Western, Alberta White, New Manitoba, White Western. These or similar so-called variety names are often applied to ordinary commercial grain when purchased by dealers and sold as seed. Eighteen samples were reported only as white, eight as black and a number of others under such names as Regenerated, with no indication of the variety. For the table all of these are included in the number for which no variety name is given.

VARIETIES OF BARLEY.

Varieties.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Total number of samples	408	25	12	2	56	84	60	104	59	6
O. A. C. No. 21.....	47	3	2		2	38	1		1	
Mandscheuri.....	33	1	1		3	22		6		
Duckbill.....	9	2	3	1	3					
Mensury.....	7	1			2		4			
Beaver.....	4							3	1	
Hulless.....	3								3	
Garton's 68.....	2							2		
Beardless.....	1							1		
Chevalier.....	1	1								
English Malting.....	1							1		
Invincible.....	1	1								
Odessa.....	1							1		
O. A. C. No. 1.....	1				1					
Triumph.....	1					1				
Mixed.....	1				1					
Variety not known.....	295	16	6	1	44	23	55	90	54	6

Included among the samples for which no variety name is given are 105 reported as 6-rowed, 21 as 2-rowed and 2 as 4-rowed.

VARIETIES OF SPRING WHEAT.

Varieties.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Total number of samples	506	24	18	6	61	22	100	202	66	7
Red Fife.....	252	2	4	1	17	1	84	110	32	1
White Fife.....	39	12	4	2	4	16			1	
Marquis.....	38	1					5	22	10	
White Russian.....	19	6	9	3	1					
Stanley.....	17							6	11	
Preston.....	13				1			10	2	
Bluestem.....	4						4			
Laurel.....	3							3		
Champlain.....	2								2	
Alberta Red.....	1								1	
Black Sea.....	1				1					
Club.....	1								1	
Burril.....	1				1					
Lost Nation.....	1				1					
St. Lawrence.....	1				1					
Unity.....	1							1		
White Chaff.....	1	1								
Mixed.....	5				3	1		1		
Variety not known.....	106	2	1		31	4	7	49	6	6

Several samples of spring wheat included in the above table among those for which no variety is given were reported under such names as Manitoba Hard or Western.

VARIETIES OF FALL WHEAT.

Ontario was the only province from which samples of fall wheat were collected. Of the 29 samples, only one was without a variety name. Dawson's Golden Chaff was reported 18 times; Early Clawson, 3; Early Windsor, 3; Mogul, 2; Abundance, 1; Winter King, 1.

TREATMENT FOR THE PREVENTION OF SMUT.

The treatment of seed grain for the prevention of smut is quite generally practised throughout the Prairie Provinces. Experience has shown that if it is neglected serious losses will follow. In the eastern provinces there is considerable smut in the grain crops each year, but it has not been sufficiently prevalent to make treatment for its prevention general. The losses are much greater in Eastern Canada than is realized and the value of the crops would be considerably increased if treatment for smut prevention were more generally practised. Over half the samples of fall wheat collected in Ontario contained smut and it is also very common in the spring crops, especially oats. The following table gives the number of samples representing the lots that were treated. It will be noted from the samples for which the method of treatment was reported that formalin is much more popular than bluestone.

Kind of Grain.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
<i>Oats—</i>										
Number of lots reported.....	978	51	60	8	158	164	146	224	132	35
Treated.....	392	9	7	.....	.....	6	67	211	74	18
With formalin.....	291	.....	.....	.....	.....	1	57	170	48	15
With bluestone.....	19	.....	.....	.....	.....	.....	9	5	3	2
Method not specified.....	82	9	7	.....	.....	5	1	36	23	1
Not treated.....	586	42	53	8	158	158	79	13	58	17
<i>Spring wheat—</i>										
Number of lots reported.....	506	24	18	6	61	22	100	202	66	7
Treated.....	361	14	3	1	.....	.....	93	193	63	4
With formalin.....	228	.....	.....	.....	.....	.....	57	120	48	3
With bluestone.....	50	.....	.....	.....	.....	.....	36	10	3	1
Method not specified.....	83	14	3	1	.....	.....	.....	63	2	.....
Not treated.....	145	10	15	5	61	22	7	9	13	3
<i>Fall wheat—</i>										
Number of lots reported.....	29	.....	.....	.....	.....	29	.....	.....	.....	.....
Not treated.....	29	.....	.....	.....	.....	29	.....	.....	.....	.....
<i>Barley—</i>										
Number of lots reported.....	408	25	12	2	56	84	60	104	59	6
Treated.....	167	9	.....	.....	.....	5	25	76	49	3
With formalin.....	123	.....	.....	.....	.....	2	17	73	28	3
With bluestone.....	9	.....	.....	.....	.....	.....	8	1	.....	.....
Method not specified.....	35	9	.....	.....	.....	3	.....	2	21	.....
Not treated.....	241	16	12	2	56	79	35	28	10	3

SOURCES OF SEED SUPPLY.

Slightly over seventy five per cent of the farmers from whom samples of wheat, oats, barley and flax were collected grew their own seed. About twelve per cent secured it from other farmers and five per cent from dealers. From the table below it

will be seen that the proportion of farmers who secured their seed from dealers was largest in Quebec, Nova Scotia and New Brunswick. In Quebec the amount of seed wheat from dealers was especially large. It is significant that the wheat sampled in Quebec contained on the average five times as many noxious weed seeds per pound as that from any other province.

Nearly all the grain purchased from dealers and used as seed in the eastern provinces comes from Western Canada; as a rule it is ordinary commercial grain that has had no special selection or cleaning. It almost invariably contains large numbers of weed seeds and the vitality of the oats is often injured by frost. Until a few years ago this grain was openly sold as seed, but this practice has been largely checked by the enforcement of the Seed Control Act. It is still offered under the Canada Grain Act grades without being definitely represented as seed. When a farmer asks for seed he is shown this grain with the explanation that it is not sold specially for seed but that it is often used for that purpose and is quite suitable. In this way the dealer protects himself against legal responsibility and the farmer who uses the grain for seed does so at his own risk and usually with disappointing results.

Dealers who handle grain for seed in this way are not to be confused with reliable seed merchants who usually supply well-cleaned grain of good quality.

Most of the home grown seed and that secured from other farmers might have been much improved by a more thorough cleaning to remove weed seeds and inferior kernels.

The following table indicates, so far as information could be secured, the sources of supply of the lots which were sampled.

Kind of Grain.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
<i>Oats—</i>										
Number of lots reported	978	51	60	8	158	164	146	224	132	35
Home grown	737	49	42	8	63	126	138	202	86	23
From other farmers	110	.....	6	.....	18	28	.....	13	36	9
From dealers	57	1	11	.....	30	3	4	1	7	.....
Sources not given	74	1	1	.....	47	7	4	8	3	3
<i>Spring wheat—</i>										
Number of lots reported	506	24	18	6	61	22	100	202	66	7
Home grown	371	24	15	5	15	5	93	165	43	6
From other farmers	52	.....	1	.....	6	14	.....	12	19	.....
From dealers	28	.....	2	1	17	3	.....	1	3	1
Sources not given	55	.....	.....	.....	23	.....	7	24	1	.....
<i>Fall wheat—</i>										
Number of lots reported	29	.....	.....	.....	.....	29	.....	.....	.....	.....
Home grown	13	.....	.....	.....	.....	13	.....	.....	.....	.....
From other farmers	14	.....	.....	.....	.....	14	.....	.....	.....	.....
From dealers	2	.....	.....	.....	.....	2	.....	.....	.....	.....
<i>B. v. rley—</i>										
Number of lots reported	408	25	12	2	56	84	60	104	59	6
Home grown	289	23	7	2	18	61	55	80	37	6
From other farmers	62	.....	.....	.....	7	19	.....	13	21	.....
From dealers	27	.....	5	.....	15	3	.....	3	.....	.....
Sources not given	30	2	.....	.....	16	1	2	8	1	.....
<i>Flax—</i>										
Number of lots reported	144	.....	.....	.....	.....	.....	48	90	6	.....
Home grown	122	.....	.....	.....	.....	.....	47	73	2	.....
From other farmers	14	.....	.....	.....	.....	.....	1	9	4	.....
Sources not given	8	.....	.....	.....	.....	.....	.....	8	.....	.....

RATES OF SEEDING.

The following table shows the highest, lowest and average rates of seeding in bushels per acre reported in the different provinces. In some cases the low rates were used when only a light nurse crop for clover was desired.

Kind of Grain.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
<i>Oats—</i>										
Highest.....	4.5	4	4	3.5	4	3.5	4	4	4	4.5
Lowest.....	1.5	2.5	2	2	2	1.5	2	2	2	2.75
Average.....	2.72	3.3	3.37	2.58	2.69	2.34	2.61	2.6	2.83	3.39
<i>Spring wheat—</i>										
Highest.....	3.5	3	2.5	1.5	3.5	2.25	1.5	2.75	2.25	2
Lowest.....	0.5	1.75	1.5	1.5	0.5	1.5	1.25	1	1.25	1.66
Average.....	1.71	1.95	2.25	1.5	1.76	1.84	1.47	1.76	1.62	1.96
<i>Fall wheat—</i>										
Highest.....	2					2				
Lowest.....	1					1				
Average.....	1.83					1.83				
<i>Barley—</i>										
Highest.....	3.5	2.5	3	1.5	3	3	3	3.5	3.5	3
Lowest.....	0.5	1.5	1.5	1.5	1	1	0.5	1.5	1	2
Average.....	2.02	1.89	2.06	1.5	2.04	1.75	1.93	2.29	1.98	2.75
<i>Flax—</i>										
Highest.....	0.75						0.75	0.75	0.5	.....
Lowest.....	0.5						0.5	0.5	0.5	.....
Average.....	0.59						0.51	0.63	0.5	.....

CLEANING AND SELECTION.

The most significant feature of the inquiry is the information brought out in regard to the impurities sown with the seed as a result of the lack of proper cleaning. Nearly eleven per cent of the wheat, oats, barley and flax sampled were being sown direct from the thresher with no cleaning whatever. Over eighty-eight per cent were reported as having been cleaned with a fanning-mill, some being put through twice, while less than one per cent received special attention by hand in the field.

Among the lots reported as having been cleaned with a fanning-mill are a number which were sampled before the cleaning was done, as indicated in the table below. In some cases the farmers did not have all their seed prepared when the inspectors called, as the visits were made in time to secure samples of the seed sown first. The analysis given below covers all the samples collected and is therefore inaccurate, as indicating the impurities put into the ground with the seed, to the extent to which they were removed from the lots which were cleaned after being sampled. But comparison of the uncleaned samples with those that had been passed through a fanning-mill would indicate that the general result was not greatly affected by this, as in most cases the cleaning was ineffectual.

Most of the so-called cleaned grain contained large numbers of very small weed seeds as well as small, light kernels and inert matter, clearly indicating poor results from the attempt at cleaning. With flax this is shown by the presence of such small seeds as tumbling mustard, cinquefoil, wormwood, lamb's quarters, wormseed mustard, and also grain, black bindweed and other large seeds in samples that had been through fanning-mills. One sample reported as cleaned with a common fanning-mill contained 17 species of weed seeds, including over 2,500 tumbling mustard, over 1,000 lamb's quarters, 803 black bindweed and 140 wild oats per pound, beside wheat, oats, and barley. Some of the grain samples furnish equally striking examples of failure

to remove even small weed seeds by the fanning mill. In a few instances excellent work was done, but the high average weed seed content shows that in most cases the attempt accomplished very little.

Apparently there is a general lack of appreciation of the importance of cleaning seed and also of equipment for doing it. Some of the most successful farmers reduce the bulk of their grain, when preparing it for seed, from one-third to one-half by cleaning and grading. This is a practical recognition of the principle that like produces like and that for best results nothing but pure seed and only the best kernels should be put into the ground. But most farmers appear to be content with putting the seed through a fanning-mill once or twice, and often the mills are not properly equipped. Many of those in use have only a few sieves and riddles designed for cleaning grain for market and are entirely inadequate for properly cleaning it for seed. For small seeds the equipment is even worse. Nearly all the samples of flax would have been much improved by the use of a woven wire riddle 3 x 16-inch size (three spaces to the inch one way and 16 the other), to carry the large foreign seeds over the back of the mill, and a zinc sieve below, with $\frac{1}{16}$ -inch perforations, to let through the small seeds with practically no loss of flax.

The more general use of first-class fanning-mills, fully equipped with the sieves and riddles necessary properly to clean seed, is greatly needed.

The following table indicates the cleaning and selection received by the lots of seed sampled.

	Total.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	E.C.
<i>Oats—</i>										
Number of lots reported....	978	51	60	8	158	164	146	224	132	35
Fanning-mill only.....	857	40	43	.....	133	150	142	211	121	17
*To be cleaned before sowing	67	.....	.....	.....	1	4	4	53	5	.....
Hand selection.....	8	3	.....	3	2	.....	.....	.....	.....	.....
No cleaning.....	113	8	17	5	23	14	4	13	11	18
<i>Spring Wheat—</i>										
Number of lots reported....	506	24	18	6	61	22	100	202	66	7
Fanning-mill only.....	457	19	10	2	54	22	99	187	59	6
*To be cleaned before sowing	9	.....	.....	.....	.....	.....	.....	9	.....	.....
Hand selection.....	7	2	.....	1	4	.....	.....	.....	.....	.....
No cleaning.....	42	3	8	3	3	.....	1	15	7	2
<i>Fall Wheat—</i>										
Number of lots reported....	29	.....	.....	.....	.....	29	.....	.....	.....	.....
Fanning-mill only.....	28	.....	.....	.....	.....	28	.....	.....	.....	.....
No cleaning.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....
<i>Barley—</i>										
Number of lots reported....	408	25	12	2	56	84	60	104	59	6
Fanning-mill only.....	353	22	4	.....	49	75	58	87	56	2
*To be cleaned before sowing	40	.....	.....	.....	1	.....	5	29	5	.....
Hand selection.....	3	2	.....	1	.....	.....	.....	.....	.....	.....
No cleaning.....	52	1	8	1	7	9	2	.....	3	4
<i>Flax—</i>										
Number of lots reported....	144	.....	.....	.....	.....	.....	48	.....	6	.....
Fanning mill only.....	128	.....	.....	.....	.....	.....	47	76	5	.....
*To be cleaned before sowing	47	.....	.....	.....	.....	.....	21	25	1	.....
No cleaning.....	16	.....	.....	.....	.....	.....	1	14	1	.....

* These lots are included in the number reported as being cleaned with a fanning mill. They were sampled before being cleaned.

SUMMARY OF IMPURITIES IN THE SAMPLES COLLECTED.

All the samples were analysed in the Ottawa laboratory and the results furnish striking evidence of the extent to which weeds are introduced through dirty seed. The impurities, apart from inert matter such as chaff, pieces of straw, etc., are divided into three classes: (a) weed seed classed as noxious under the Seed Control Act; (b) weed seeds other than those included in the noxious list; and (c) seeds of other cultivated plants. In the first class are included the seeds of those weeds which are particularly harmful and especially legislated against by the law governing the sale of seed in Canada. Class (b) includes all weed seeds not classed as noxious; most of these are of a less harmful character although some have become dangerous in certain districts. A notable example is Russian thistle which is rapidly becoming one of the most widespread and troublesome weeds in the dryer parts of the Prairie Provinces. Class (c) includes the seeds of all cultivated plants other than the kind represented by the sample. In a few cases the grain was deliberately mixed for growing feed. This has made the average number of seeds of other cultivated plants given in the tables below somewhat higher than it would otherwise have been.

The weed seeds in grain often give an indication of where it was grown. It will be noted below that wild oats are the most prevalent noxious weed. They are quite common in some parts of Ontario but are especially prevalent in the older parts of the Prairie Provinces. The large number found in some of the samples secured in Quebec and the Maritime Provinces is fairly reliable evidence that this grain was grown in Western Canada. The seeds of ball mustard are common in grain from northern Alberta. Sinkweed is frequently found in grain from the Red River valley and parts of Saskatchewan.

In the following tables is presented a summary of the noxious weeds seeds, other weed seeds and seeds of cultivated plants which were found in the samples analysed.

SUMMARY OF IMPURITIES IN OATS.

Impurities.	Canada.	P. E. I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Number of samples tested.....	978	51	60	8	158	164	146	224	133	35
<i>Noxious weed seeds—</i>										
Samples free.. { number.....	431	43	44	6	50	70	40	85	75	18
{ per cent.....	44	84	73	75	32	43	27	39	57	51
Largest number per pound in any sample.....	4,838	8	691	64	3,600	4,838	2,153	2,164	1,216	287
Average number per pound of all samples.....	76	1	27	8	115	65	140	69	42	53
<i>Other weed seeds—</i>										
Samples free.. { number.....	118	15	13	3	12	32	15	10	15	3
{ per cent.....	12	29	24	38	8	20	10	4	11	9
Largest number per pound in any sample.....	6,954	2,216	3,872	1,052	6,954	1,010	5,993	6,429	2,405	2,336
Average number per pound of all samples.....	239	181	294	396	232	75	229	412	139	308
<i>Seeds of other cultivated plants—</i>										
Samples free.. { number.....	44	9	6	2	8	4	8	1	2	4
{ per cent.....	4½	8	10	25	5	2	5	½	1½	11
Average number per pound of all samples.....	40	140	236	441	405	58	455	454	279	356

The sample of oats containing the largest number of noxious weed seeds was secured from a farmer in Leeds county, Ontario. These oats were home-grown, the seed having been secured from a neighbour the previous year. They had been run through a fanning-mill to clean for sowing. The effectiveness of the cleaning may be judged from the fact that they contained 4,800 wild mustard seeds and 38 Canada

thistle seed per pound, beside 174 seeds of weeds not classed as noxious, including five species. These oats were sown at the rate of two bushels per acre, which would put over 2,000 noxious weed seeds on each square rod.

The sample containing the largest number of weed seeds other than those classed as noxious was secured from a farmer in Montmagny county, Quebec. The origin was not given. These oats were reported as having been cleaned with a fanning-mill. They contained nine species of weed seeds, the most prevalent being spurrey. The noxious weed seeds consisted of 139 ox-eye daisy and 43 Canada thistle per pound, making a total of 7,136 weed seeds per pound. They were seeded at the rate of 2½ bushels per acre, which would put about 3,600 weed seeds on a square rod.

With the average weed seed content and rate of seeding shown in the preceding tables, weed seeds would be placed on the land seeded to oats at the average rate of about 44 noxious and 138 other sorts per square rod.

SUMMARY OF IMPURITIES IN BARLEY.

Impurities.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Number of samples tested.....	408	25	12	2	56	44	60	104	59	6
<i>Noxious weed seeds—</i>										
Samples free... { number	174	24	11	2	17	54	8	25	32	1
{ per cent.....	43	96	92	100	30	64	13	24	54	17
Largest number per pound in any sample.....	2,539	7	5	.....	946	159	854	1,234	2,539	176
Average number per pound in all samples.....	53	4	4	.....	90	11	71	1	24	45
<i>Other weed seeds—</i>										
Samples free... { number	56	7	3	1	8	23	8	1	50	.....
{ per cent.....	14	28	25	50	14	27	13	1	8	.....
Largest number per pound in any sample.....	9,968	2,768	208	80	6,440	1,300	9,968	7,969	2,752	9,632
Average number per pound in all samples.....	445	111	17	40	510	35	551	824	278	2,241
<i>Seeds of other cultivated plants—</i>										
Samples free... { number	13	7	1	1	1	1	.....	1	1	.....
{ per cent.....	3	28	8	50	2	1	.....	1	14	.....
Average number per pound in all samples.....	649	215	517	212	1,261	34	424	44	398	730

It will be noted that the average number of noxious weed seeds in the barley was considerably lower than in the oats though the number of other weed seeds was nearly twice as high.

The sample containing the largest number of noxious weed seeds was from near Edmonton, Alta. With the exception of 16 wild oats, the 2,539 noxious weed seeds were all ball mustard. This sample also contained 2,283 other weed seeds per pound, making a total of 4,822. At the rate at which the barley was seeded, about 3,000 noxious weed seeds would be placed on each square rod. It was represented as yet to be cleaned with a fanning-mill, but unless the attempt was more successful than in most cases it probably went into the ground with little improvement.

The sample containing the largest number of weed seeds other than those classed as noxious was secured from a farmer in southern Manitoba. It also contained 44 noxious weed seeds, making over 10,000 of all kinds per pound. About four-fifths of these were lamb's quarters. This barley was sown at the rate of two bushel per acre which would put over 6,000 weed seeds on each square rod.

With the average weed seed content and rate of seeding shown above, weed seeds would be placed on the land seeded to barley at the average rate of 32 noxious and 270 other sorts per square rod.

SUMMARY OF IMPURITIES IN SPRING WHEAT.

Impurities.	Canada.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Number of samples tested ...	500	24	18	6	61	22	100	202	66	7
Noxious weed seeds—										
Samples free.. { Number	235	17	11	2	8	3	22	108	50	3
{ per cent.....	46	71	71	50	13	14	32	53	76	43
Largest number per pound in any sample.....	11,528	42	19	163	11,528	300	967	624	689	105
Average number per pound in all samples.....	79	7	4	25	201	43	78	23	33	23
Other weed seeds—										
Samples free.. { Number.....	52	10	2	2	6	1	5	11	14	1
{ per cent.....	10	42	11	33	26	5	5	5	21	43
Largest number per pound in any sample.....	17,415	1,103	1,517	17,415	3,060	2,818	1,264	9,035	1,379	11,686
Average number per pound of all samples.....	343	142	280	2,317	507	288	248	319	90	1,827
Seeds of other cultivated plants—										
Samples free.. { number	121	13	1	1	1	1	40	40	23	1
{ per cent.....	24	54	0	17	14	5	40	20	35	14
Average number per pound of all samples	166	35	168	1,147	380	70	28	97	32	2,732

Noxious weed seeds were more prevalent in the spring wheat samples than in either oats or barley. The sample containing 11,528 noxious weeds per pound was taken from a farmer in one of the southern border counties of Quebec. It represented home-grown seed that was being sown without cleaning. With the exception of a few seeds of wild oats and purple cockle, the noxious seeds were all wild mustard. This seed was sown at the rate of two bushels per acre, which would put noxious weeds on the land at the rate of about 8,000 per square rod.

The sample containing 17,415 weed seeds per pound other than those classed as noxious was taken in New Brunswick and was represented as home-grown seed that was being sown without cleaning. This seed also contained 153 noxious weed seeds per pound. It was sown at the rate of a bushel and a half per acre, which would put about 9,800 weed seeds of all kinds on each square rod.

With the average weed seed content and rate of seeding shown above, weed seeds would be placed on the land sown to spring wheat at the average rate of 50 noxious and 220 other sorts per square rod.

SUMMARY OF IMPURITIES IN FALL WHEAT.

Impurities.	Ontario.
Number of samples tested.....	29
Noxious weed seeds—	
Samples free { Number.....	18
{ Per cent.....	63
Largest number per pound in any sample.....	176
Average number per pound of all samples.....	9
Other weed seeds—	
Samples free { Number.....	7
{ Per cent.....	24
Largest number per pound in any sample.....	187
Average number per pound of all samples.....	63
Seeds of other cultivated plants—	
Samples free { Number.....	5
{ Per cent.....	17
Average number per pound in all samples	18

The number of weed seeds in the Fall wheat samples was much smaller than in the other grains. The average number of noxious weed seeds per pound was about one-ninth of the number in Spring wheat, while the number of other weed seeds was only about one-twentieth as high. Fall wheat samples were collected only in Ontario and mostly from the eastern part of the province.

SUMMARY OF IMPURITIES IN FLAX.

Impurities.	Total.	Man.	Sask.	Alta.
Number of samples tested.....	144	48	90	6
<i>Noxious weed seeds—</i>				
Samples free { Number.....	17	1	13	3
Per cent.....	12	2	14	50
Largest number per pound in any sample.....	15,424	6,224	15,424	33
Average number per pound of all samples.....	663	600	706	10
<i>Other weed seeds—</i>				
Samples free { Number.....	7	3	2	2
Per cent.....	5	4	2	50
Largest number per pound in any sample.....	13,064	12,764	13,964	656
Average number per pound of all samples.....	4,087	10,068	1,161	211
<i>Seeds of other cultivated plants—</i>				
Samples free { Number.....	36	13	30	4
Per cent.....	25	25	23	67
Largest number per pound in any sample.....	3,134	2,960	3,134	400
Average number per pound of all samples.....	264	353	229	75

The noxious weed seeds in the sample containing 15,424 per pound were made up as follows: Wild mustard 11,936, false flax 1,792, wild oats 1,280, hare's-ear mustard 288, and stickseed 128. It also contained 11,616 other weed seeds per pound, mostly lamb's quarters. This sample was taken in central Saskatchewan and represented seed that had been in the stack over winter and threshed the following May. It was sown at the rate of one-half bushel per acre, which would put approximately 2,700 noxious and 2,000 other weed seeds on each square rod.

The sample containing the largest number of weed seeds other than those classed as noxious contained none of the noxious species. The most prevalent weed seeds were black bindweed and lamb's quarters. This flax was to be put through the fanning-mill once more before being seeded.

With the average weed seed content and rate of seeding above shown, weed seeds would be placed on the land sown to flax at the average rate of about 136 noxious and 840 other sorts per square rod. As previously stated, some of the lots were to be passed through a fanning mill after the samples were taken; but making liberal allowance for the improvement which might be made in this way, the facts furnish sufficient explanation of the weed infection which so often appears on new land after being seeded with flax.

DETAILS OF IMPURITIES IN SAMPLES COLLECTED.

Details of the impurities as they occurred in the samples collected and analysed are presented in the following tables:—

DETAILS OF IMPURITIES IN OATS.

COLUMNS "A"—Number of samples containing the impurities named in the column to the left.
COLUMNS "B"—Average number of impurities per pound in samples, counting only those in which the impurity occurred.

Impurities in order of prevalence.	Canada.		P. E. Island.		N. & S. Scotia.		New Brunswick.		Quebec.		Ontario.		Manitoba.		Saskatchewan.		Alberta.		British Columbia.	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
Number samples tested	978		51		60		8		156		164		146		224		132		35	
<i>Noxious Weed Seeds—</i>																				
Wild oats.....	347	83							36	70	50	27	90	155	100	60	34	47	24	57
Ball mustard.....	120	53	1	8	10	97	1	32	11	30	5	110	30	24	30	31	30	115	2	15
Wild mustard.....	93	269			2	82			47	188	16	45	12	54	16	45	6	13	1	11
Sticksweed.....	64	49			1	154			6	27	9	22	13	102	29	22				
Purple cockle.....	48		1	16					5	15	16	9	17	13	9	4				
Canada thistle.....	44	16	1	8					12	31	19	16	8	13	4	31	1			
False flax.....	43	22			1	12			6	66	4	12	9	13	22	16				
Ragweed.....	43	36			2	11			25	147	5	11	10	20						
Campions.....	41	36			1	7			13	31	14	5	13	76						
Hare's ear mustard.....	32	23			2	58			5	47	1	12	5	37	15	9	3	16	1	6
Stinkweed.....	28	30			3	28			5	29	3	14	14	68	5	47				
Sow thistle.....	24	26			1				7	23	5	64	6	78	3	4		3		
Cow cockle.....	19	60							2	11	1	57	7		16	153				
Tumbling mustard.....	18	140			1	6			3	14	5	8	2	5	5	8		1	13	
Docks.....	17	15			1	8			7	67	1	4	1	5	6	16				
Ox-eye daisy.....	10	57			2	35	1	32	1	9	3	3	1	5			2	113	1	57
Field bindweed.....	9	38							1	41	1	12								
Dandelion.....	6	51							3											
Chicory.....	4	34																		
Wild carrot.....	1	64			1	64														
Ribwort.....	1	4																		
<i>Other Wild Seeds—</i>																				
Black bindweed.....	678	116	22	28	23	94	1	13	97	77	96	39	117	93	188	189	106	30	25	24
Lamb's quarters.....	37	100	1	9	11	151			37	165	35	85	72	217	111	334	56	123	11	53
Lady's thumb.....	141	43	6	92	20	53	2	40	61	29	35	45	1	5	2	23		14	14	24
Spurrey.....	86	317	19	371	21	500	3	363	36	225			1	32	1	82		5	1	
Hemp nettle.....	72	27	11	25	17	36			30	23	7	34	5	17	1	6				
Yellow foxtail.....	64	64							45	58	16	30	3	9						
Prairie sunflower.....	51	38			2	5			5	14	3	8	11	10	27	62	8	19		
Sun spurge.....	33	52							23	32	2								1	5
Ergot.....	29	6			1	15			2	8	2	4			23	5				

DETAILS OF IMPURITIES IN SAMPLES COLLECTED

[illegible]

DETAILS OF IMPURITIES IN OATS—Continued.

COLUMNS "A"—Number of samples containing the impurities named in the column to the left.
 COLUMNS "B"—Average number of impurities per pound in samples, counting only those in which the impurities occurred.

Impurities in order of prevalence.	Canada.		P. E. Island.		Nova Scotia.		New Brunswick.		Quebec.		Ontario.		Manitoba.		Saskatchewan.		Alberta.		British Columbia.	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
<i>Other Weed Seeds—Con.</i>																				
Hound's tongue.....	1	6									1	6								
Marsh elder.....	1	38															1	28		
Sweet clover.....	1	6							1	51										
Stitchwort.....	1	51																		
Wild barley.....	1	3													1	3				
Turdian.....	1	6																		
Yellow daisy.....	1	5											1	5						
Wild aster.....	1	384																		
Field peppergrass.....	1	37																		
Other sorts.....	12	607			2	125			3	265					4	67	1	15	3	4
<i>Seeds of Other Cultivated Plants—</i>																				
Barley.....	593	220	21	78	37	83	2	51	106	227	126	242	51	529	110	182	108	179	11	96
Wheat.....	562	289	17	36	32	70	3	15	96	170	112	234	47	612	145	443	97	108	14	54
Black oats (in white oats).....	535	104	21	65	35	125			72	90	80	277	44	122	155	66	111	60	12	103
Buckwheat.....	110	70	5	42	17	49	3	21	51	90	37	59							7	5
Flax.....	88	130			3	136			20	69	7	13	9	144	25	104	4	32	1	11
Vetch.....	192	25	10	25	12	17	1	56	91	27	63	22	7	4	4	29	11	13	4	112
Wheat in rye grass.....	65	24	1	8	4	41	1	26	5	21	9	11	5	5	5	35	11	12	1	200
Timothy.....	58	128	2	22	8	56			13	81	9	457	7	21	8	155	5	13	6	100
Peas.....	43	20	1	8	3	13			19	37	19	16							1	103
White oats (in black oats).....	29	617	8	389	2	1122	2	1617			3	245	7	55	3	100	3	6	1	103
Alsike.....	27	112							5	54	8	270	4	16	3	213	1	7	3	8
Red clover.....	17	93							4	14	4	346	3	19	1	11	3	6		
Rye.....	12	500							9	677										
White clover.....	4	11			1	74														
Alfalfa.....	4	217									2	8								
Millet.....	4	22									3	368			1	5	1	148	3	14
Blue grass.....	2	24			1	51					3	8								
Beans.....	2	5																	1	10
Red top.....	2	19									3	5								
Awless bromo grass.....	2	10			1	52													1	4
Orchard grass.....	1	5							1	5							1	7		

DETAILS OF IMPURITIES IN BARLEY—Continued.

COLUMNS "A." Number of samples containing the impurities named in the column to the left.
COLUMNS "B." Average number of the impurities per pound in samples, counting only those in which the impurities occurred.

Impurities in order prevalence.	Canada.			P. E. Island.			Nova Scotia.			New Brunswick.			Quebec.			Ontario.			Manitoba.			Saskatchewan.			Alberta.			British Columbia.		
	A.	B.		A.	B.		A.	B.		A.	B.		A.	B.		A.	B.		A.	B.		A.	B.		A.	B.		A.	B.	
<i>Other Weed Seeds—Con.</i>																														
Chenopodium	4	71											3	3		3	5								1	16				
Redstraw	4	4																												
Iron-side thistle.	3	8																	2	9										
Pull thistle.	3	297																	1	4										
Hedge nettle.	3	6											1	6																
Maple-leaved goosefoot.	3	349											2	18																
Red-root pigweed.	3	7																	2	8										
Gilia.	3	9																												
Plantain.	2	998																	1	91								1	1904	
Worm-seed mustard	2	25																	1	16										
Sedges.	2	34											1	20																
Yarrow.	2	5																	1	5										
Wormwood.	2	22																	1	40										
Hound's tongue.	2	3																												
Mayweed.	2	6																												
Wall-flower.	2	10																												
Fragrant giant hyssop.	1	1293																												
Wild aster.	1	4																	1	4										
Atriplex.	1	52																												
Old witch grass.	1	7											1	7																
Healing herb.	1	108											1	108																
Low mallow.	1	4																												
Meadow rue.	1	30																												
Meadow soft grass.	1	611																										1	611	
Pale plantain.	1	160																												
burdock.	1	4											1	4																
their sorts.	15	22											4	6		1	63		3	11		6	34		1	4				
<i>Seeds of Other Cultivated plants—</i>																														
White oats.	382	443		16	840		11	322		1	192		52	553		80	322		60	267		99	606		57	306		6	679	
Wheat.	244	157		11	74		8	40					28	46		40	44		52	159		63	326		39	128		3	79	
Black oats.	68	115		3	53		2	2299					11	33		9	11		4	51		26	33		12	52		1	48	
Buckwheat.	53	104		4	12		4			1	232		30	163		13	20											1	16	
Flax.	41	50		1	6								5	21					9	71		25	53		1	5				

Timothy	31	54	1	220	13	62	7	30	3	26	6	48	1	11	...
Western rye grass	23	37	1	32	5	22	2	24	...	...	12	52	3	13	...
Alsike	13	20	...	...	6	34	4	11	1	4	2	3	...	...	...
Vetch	13	13	...	...	6	10	4	21	...	...	...	...	1	6	...
Peas	12	10	...	...	4	18	5	5	...	...	1	12	...	...	...
Red clover	8	6	...	...	...	...	3	7	1	8	...	...	...	...	...
Blue grass	7	71	...	...	4	5	2	172	4	36	1	8	...	...	...
Black barley (in white)	7	152	...	...	1	11	1	18	...	...	3	176	2	253	...
Millet	6	15	...	...	2	14	3	7	1	39	...	...	...	...	...
Rye	5	22	...	...	3	32	2	8	...	...	...	...	...	...	...
White clover	2	66	...	...	1	4	...	...	...	...	...	...	...	...	...
White barley (in black)	2	103	...	...	1	170	...	...	1	36	...	...	1	8	...
Alfalfa	2	6	...	...	...	...	1	3	1	10	...	...	...	1	...
Awless brome grass	2	8	...	...	...	...	...	4	...	...	...	...	...	...	...
Beans	1	4	...	...	...	...	...	...	...	...	...	...	...	...	...

DETAILS OF IMPURITIES IN SPRING WHEAT.

Number of samples tested	546	24	18	6	61	22	100	202	66	7	...
<i>Noxious Weed Seeds—</i>											
Purple cockle	127	7	6	3	30	18	34	30	12	4	13
Wild oats	118	17	1	...	17	1	43	34	20	20	...
Ball mustard	57	...	...	...	21	2	33	34	6	197	...
Wild mustard	52	...	...	...	...	...	13	42	2	8	...
Stinkweed	46	...	...	...	...	...	20	50	1	25	...
Clow cockle	31	1	1	8	3	5	11	17	11	...	...
Great ragweed	28	...	...	...	11	1	13	31	11	...	...
Campion	26	...	...	...	12	4	15	31	...	...	...
Stinkweed	21	...	...	...	5	...	14	76	...	...	...
Sow thistle	20	2	1	7	9	2	19	47	2	...	...
Fl. re-sear mustard	17	14	1	...	9	...	4	3	1	...	...
False flax	13	...	...	...	1	...	5	80	...	...	...
Canada thistle	12	...	1	...	7	...	1	6	2	23	...
Barrel	10	...	...	1	...	...	2	2	...	...	...
Tumbling mustard	9	...	...	1	13	1	6	14	...	...	...
Pocks	6	...	...	...	1	...	25	...	1	689	...
Ox-eye daisy	6	...	...	...	3	1	68	...	...	...	...
Field bindweed	4	...	...	1	...	...	...	...	1	29	...
Chicory	3	...	...	1	135	2	105	...	...	...	...
Wild carrot	2	...	...	...	...	...	...	...	1	24	...
Ribgrass	1	...	...	...	2	101	...	...	...	...	...
Other Weed Seeds—											
Black bindweed	405	13	14	4	48	19	83	180	41	86	6
Lamb's quarters	221	2	11	1	20	3	31	121	22	33	3
Lady's thumb	57	2	119	2	27	4	14	7	1	6	4
Wild vetch	55	7	57	2	16	14	76	12	4	1	1
Hemp nettle	52	7	34	1	21	2	17	746	1	...	...

DETAILS OF IMPURITIES IN SPRING WHEAT—Continued.

COLUMNS "A"—Number of samples containing the impurities named in the column to the left.
COLUMNS "B"—Average number of impurities per pound in samples, counting only those in which the impurities occurred.

Impurities in order of prevalence.	Canada.		P. E. Island, Nova Scotia.		New Brunswick.		Quebec.		Ontario.		Manitoba.		Saskatchewan.		Alberta.		British Columbia.	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
Other Weed Seeds—Con.																		
Wolfberry	42	9					1	16	1	3	9	6	26	11	5	6		
Ergot	36	7			3	19	3	5	1	1	2	2	22	6	2	7		
Spurrey	34	512			3	1,703	17	301									2	2,257
Prairie rose	30	6					1	9			18	5	9	6	2	3		
Knotweed	19	275			1	38	5	36	5	8	3	2	2	24				
Green foxtail	18	101					8	72	4	49	6	41						
Yellow foxtail	18	77					14	47	3	9			1	5				
Sun spurge	13	163					13	163										
Sheep sorrel	12	89			2	15	1	16	2	5								
Barley grass	9	17			1	6	1	135	4	8	1	11					5	413
Smartweed	9	22			1	7	2	18	4	2							1	21
Prairie sunflower	9	15					1	15			2	5	6	18				
Peppergrass	8	9					1	3			4	9	3	11				
Hedge nettle	8	13			1	13					2	4	4	4	1	6		
Wall-flower	7	21					1	15			2	4	4	4	30	1	6	
Worm-seed mustard	7	11					1	6			3	8	3	16				
Chickweed	6	52			1	45	2	94			1	4	1	6			1	67
Couch grass	6	101			1	64	2	72										
Buttercup	6	5			1	106	5	4	1	8			1	6				
Russian pigweed	6	35									3	18	3	51				
Roadside thistle	5	9											3	8	2	13		
Beggar-ticks	5	3			1	9	3	2			1	1						
Hall thistle	5	6					1	3					3	4				
Shepherd's purse	4	4					1	1			2	5	1	4				
Black medick	4	47					2	4	1	3			1	176				
Cinquefoil	4	17					1	4			1	18	2	23				
American dragonhead	3	4									3	4						
Catnip	3	7					1	9	1	8	1	4						
Bedstraw	3	14					3	14										
Healing herb	3	11					1	3	2	15								
Cheese	3	920							1	2,754	1	4	1	3				
Red-root pigweed	3	102					1	3	1			3			1	301		
Gilia	3	23																
Yarrow	3	45					1	5					3	23				

DETAILS OF IMPURITIES IN SAMPLES COLLECTED

23

Winnwood.....	3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															</
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DETAILS OF IMPURITIES IN FALL WHEAT.

COLUMNS "A"—Number of samples containing the impurities named in the column to the left.
COLUMNS "B"—Average number of impurities per pound in samples, counting only those in which the impurities occurred.

Impurities in order of prevalence.	Ontario.		Impurities in order of prevalence.	Ontario.		Impurities in order of prevalence.	Ontario.	
	A.	B.		A.	B.		A.	B.
Number of samples tested.....	29		<i>Other Weed Seeds—</i> Black bindweed..... Chess..... Lamb's quarters..... Green foxtail..... Red-root pigweed..... Black medick..... Couch grass..... Knotweed..... Other sorts.....	8	9	<i>Seeds of Other Cultivated Plants—</i> Barley..... Oats..... Vetch..... Rye..... Alfalfa..... Buckwheat..... Peas..... White clover.....	11	10
Noxious Weed Seeds—				7	68		9	27
Stickseed.....	4	44		2	8		6	12
Wild oats.....	4	5		2	6		4	13
Campions.....	3	6		1	16		3	7
Purple cockle.....	2	18		1	2		3	6
Canada thistle.....	1	3		1	15		1	4
Wild mustard.....	1	3		1	3		1	4
Sow thistle.....	1	3		13	105		1	6

DETAILS OF IMPURITIES IN FLAX.

COLUMNS "A"—Number of samples containing the impurities named in the column to the left.
COLUMNS "B"—Average number of impurities per pound in samples, counting only those in which the impurities occurred.

Impurities in order of prevalence.	Canada.		Manitoba.		Saskatchewan.		Alberta.		Impurities in order of prevalence.	Canada.		Manitoba.		Saskatchewan.		Alberta.	
	A.	B.	A.	B.	A.	B.	A.	B.		A.	B.	A.	B.	A.	B.	A.	B.
Number samples tested....	144		48		90		6		<i>Other Weed Seeds—Con.</i>	3	277	1	112	3	300		
<i>Noxious Weed Seeds—</i>									Russian thistle.....	3	32	3	32	3	8		
False flax.....	91	182	32	119	56	195	3	14	Lady's thumb.....	3	16	1	32	2	7		
Wild mustard.....	60	486	26	152	33	842	1	19	Chickweed.....	3	15	1	32	2	64		
Stickseed.....	57	145	23	297	34	41			Old witch grass.....	2	190	1	317	3	35		
Wild oats.....	51	167	31	146	20	201			Bull thistle.....	2	35	2	35	2	11		
Harb-weed mustard.....	42	190	2	648	40	72			Toadflax.....	2	29	2	9	1	16		
Ball mustard.....	25	34	15	24	10	47			Pale plantain.....	2	13	1	1	1	1		
Tumbling mustard.....	20	1,186	2	34	18	937			Wild vetch.....	2	11						
									Sheep sorrel.....	2							

GERMINATION OF OATS, BARLEY, WHEAT AND FLAX.

Germination tests of the samples collected indicate that on the whole the vitality of the seed was fairly good, although a considerable proportion of the lots must have given disappointing returns through failure to produce a full stand.

The vitality of seed is liable to be impaired by a variety of causes. Among the most common are frost before ripening, immaturity, weathering, heating, improper curing, mould and must. The germinating strength of grain is often greatly lowered by the presence of small, immature or shrunken kernels, which produce weak plants or none at all if conditions are unfavourable. Such kernels are especially prevalent in oats. All grain intended for seed should be thoroughly cleaned and graded to retain only the strong plump kernels.

As shown by the table below, the average germination of the oats was 87 per cent, which is lower than with any of the other grains. Apart from the presence of weak kernels through lack of proper cleaning, the most common cause of low vitality in oats is frost. A very light frost when oats are in the milk stage is sufficient to ruin them for seed. When they are more matured the injury is not so great, but in any case its extent is difficult to detect. Oats quite normal in appearance and weight may be so badly damaged by frost that their value for seed is completely destroyed. It is therefore very important that a germination test be made when there is any possibility of the seed having been frosted before harvesting. Injury to vitality from other causes is usually more noticeable.

The standard percentage germination for good seed recognized under the Seed Control Act for grain and flax is 95 per cent. The Act requires that all grain sold for seed must germinate up to at least two-thirds of the standard or be marked to show the percentage germination. It will be seen from the results of the tests that 8 per cent of the oats sampled germinated below 63 per cent or two-thirds of the standard for good seed, the largest proportion being from the Prairie Provinces and Quebec.

The barley samples averaged 91 per cent germination. About 5 per cent of the samples were below two-thirds of the standard for good seed, the largest proportion being from Quebec, Manitoba and Saskatchewan. Wet weather during harvest and insufficient drying frequently cause low germination in barley. The vitality is also susceptible to frost injury and often the extent of the damage is not shown. Usually the hull is more or less loosened and has a shrunken appearance.

With wheat the frost injury is apparent from the kernels. Damage from weathering or heat is not always so evident, although as a rule wheat that looks strong will germinate well. The spring wheat samples averaged 96 per cent germination, about 1 per cent being below two-thirds of the standard. The average germination in the fall wheat was 98 per cent with 79 per cent as the lowest.

The vitality of flax may be impaired by severe weathering or frost, but usually healthy looking seed will grow readily. The average germination of the samples collected was 86 per cent with less than 1 per cent below two-thirds of the standard for good seed.

In the following table is presented a summary of the germination tests on the oats, barley, wheat and flax, showing the average and lowest percentage germination of seed from each province and the number of samples germinating from 90 per cent to 100 per cent, from 75 per cent to 89 per cent, from 63 per cent to 74 per cent, and below 63 per cent.

ENSILAGE CORN

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GERMINATION OF OATS, BARLEY, WHEAT AND FLAX.

	Canada.	P. E. I.	N. S.	N. B.	Que.	Ont.	Man.	Sask.	Alta.	B. C.
<i>Oats—</i>										
Number of samples tested....	978	51	60	8	158	164	146	224	138	33
Number germinating :										
From 90 to 100%	637	49	37	6	83	135	114	140	49	24
From 75 to 89%	202	1	16	1	36	22	19	54	48	5
From 63 to 74%	64	1	4	1	17	5	2	11	20	3
Below 63%	75	0	3	0	22	2	11	19	15	3
Average % germination.....	87	96	88	89	82	94	90	88	74	83
Lowest % germination.....	2	72	50	65	2	50	18	15	37	30
<i>Barley—</i>										
Number of samples tested....	408	25	12	2	56	84	60	104	59	6
Number germinating :										
From 90 to 100%	295	19	10	1	34	71	36	81	40	3
From 75 to 89%	72	6	1	1	15	10	11	11	16	1
From 63 to 74%	21	0	1	0	3	1	7	5	2	2
Below 63%	20	0	0	0	4	2	6	7	1	0
Average % germination.....	91	94	93	87	88	94	86	90	92	85
Lowest % germination.....	0	79	65	82	34	0	33	27	60	66
<i>Spring wheat—</i>										
Number of samples tested....	508	24	18	6	61	22	100	202	66	7
Number germinating :										
From 90 to 100%	443	30	14	6	43	22	96	176	60	8
From 75 to 89%	46	4	4	0	10	0	2	20	6	0
From 63 to 74%	12	0	0	0	5	0	2	4	0	1
Below 63%	5	0	0	0	3	0	0	2	0	0
Average % germination.....	96	95	93	99½	90	97	97	96	96	97
Lowest % germination.....	42	76	75	90	42	91	74	43	83	65
<i>Fall wheat—</i>										
Number of samples tested....						39				
Number germinating :										
From 90 to 100%						28				
From 75 to 89%						1				
From 63 to 74%						0				
Below 63%						0				
Average % germination.....						98				
Lowest % germination.....						79				
<i>Flax—</i>										
Number of samples tested....	144						48	90	6	
Number germinating :										
From 90 to 100%	83						18	62	3	
From 75 to 89%	39						20	17	2	
From 63 to 74%	11						5	5	1	
Below 63%	11						5	6	0	
Average % germination.....	86						82	88	88	
Lowest % germination.....	11						11	16	69	

ENSILAGE CORN.

According to the Census returns, 243,491 acres were planted to corn for ensilage in the province of Ontario in the spring of 1911. About 40,000 acres are annually devoted to the crop in Quebec, mostly in the Eastern Townships, and it is being grown to a limited extent in some of the other provinces. The amount and quality of the ensilage produced is largely dependent on the variety or strain of corn planted and the vitality of the seed. In most districts early maturing varieties and strains are required in order that the corn may mature sufficiently to make sweet ensilage of high feeding

value. Failure to secure suitable varieties is the most frequent cause of sour, poor quality ensilage. In many cases, though the use of seed weak in vitality, disappointing yields are obtained, or replanting, resulting in a late and uneven crop, is necessary. It is therefore important that only the most suitable varieties be used and that all seed be of strong vitality.

For this inquiry the seed inspectors were instructed to procure from farmers samples of corn being planted for ensilage, and to secure information in regard to the variety; where the seed was procured, whether from dealers, direct from the grower, or home grown; if purchased, whether on the ear or shelled; the area planted and whether in hills or drills. About 1,900 lots of seed were reported and nearly 1,700 samples collected. The reports cover about 11,000 acres planted in the spring. 14. In many cases reports were not accompanied by samples or were not made in all the details. This accounts for the number of lots reported under different headings not being uniform. Several samples were lost through the bags being broken in the mail.

For the purpose of comparing conditions in different localities with approximately similar climates, Ontario has been divided into four districts as follows:—

District No. 1.—Counties south of Huron, Perth, Waterloo, Wellington and Halton.

District No. 2.—Counties of Huron, Perth, Waterloo, Wellington and Halton, and north and east to and including the counties of Simcoe, Ontario, Durham, Northumberland and Prince Edward.

District No. 3.—Counties north and east of Simcoe, Ontario, Durham, Northumberland and Prince Edward, except New Ontario.

District No. 4.—Rainy River District in New Ontario.

SOURCES OF SUPPLY.

The reports indicate whether the seed was secured from local or wholesale dealers, direct from the grower, or homegrown. As may be noted from the table below, except in District 1 of Ontario very few farmers grow their own seed corn. A large proportion of the seed is secured through dealers. Only a very small percentage of this is Ontario grown corn shipped on the ear. It is nearly all shelled and much of it is imported from the central and western states. A great deal of the imported seed is of late varieties and strains not suitable to Canadian conditions. During recent years the practice of purchasing seed corn of known varieties direct from growers in southwestern Ontario has been adopted by some of the best ensilage growers. This method is now being followed by quite a number of agricultural societies and farmers' clubs. Most of the growers ship their seed corn on the ear and as a rule it is much better, both in suitability for local conditions and germination, than the shelled corn handled by local dealers.

The following table indicates the number and proportion of lots in each district secured from the different sources.

	Total.	Ontario.				Quebec.
		District 1.	District 2.	District 3.	District 4.	
Number lots reported.....	1,900	190	675	838	10	187
Dealers { number.....	1,543	97	573	708	6	159
{ per cent.....	81	51	85	84½	60	85
Growers { number.....	285	35	92	127	3	28
{ per cent.....	15	18	14	15½	30	15
Home grown { number.....	72	58	10	3	1	.....
{ per cent.....	4	31	1	½	10	.....

SEED ON THE EAR AND SHELLED.

Although purchasing seed corn on the ear has many advantages, only one-quarter of the lots reported were procured in this way. The quality can be much more accurately determined. Before shelling, the poor ears can be discarded and the butts and tips removed, thus making it possible to secure a more uniform and much better sample. When corn of poor quality is sold for seed it is nearly always shelled, as its inferiority can be less easily detected. Shelled corn may include the butts and tips as well as the off-type ears and nubbins, and it is impossible to remove all of the inferior kernels even by severe grading. Unless corn has been thoroughly dried before shelling it is more liable to heat and lose its vitality than when on the ear. But all seed corn sold shelled is not of poor quality. Some first class seed is put on the market in this way. It may be produced by using only good varieties and well selected ears that have been thoroughly cured and the butts and tips removed before shelling.

It will be seen from the table below under germination that the corn shipped on the ear germinated on an average nearly six per cent more than that which was shelled. The proportion germinating 90 per cent and over was 26 per cent higher. Some of the shelled corn was quite dead. A number of the samples on the ear were also low in germination but in nearly all cases this corn was not planted. The poor quality was apparent from the appearance of the ears and purchasers procured other seed. Had this corn been shelled, the poor quality would not have been so easily detected. Corn on the ear costs more on account of the extra work in handling and the transportation charges, but as a rule the increased cost is many times repaid with the larger yield and superior quality of crop.

The following table indicates the proportions of the lots reported that were purchased on the ear and shelled.

	Total.	Ontario.				Quebec.
		District 1.	District 2.	District 3.	District 4.	
Number lots reported..	1,736	114	627	803	10	182
On Ear { number	441	20	175	214	6	26
{ per cent.	25	17½	28	27	60	14
Shelled { number	1,295	94	452	589	4	156
{ per cent.	75	82½	72	73	40	86

GERMINATION.

The vitality of corn is liable to be impaired by a great variety of causes. It is very susceptible to frost injury before maturity and requires to be thoroughly dried and stored with good ventilation. Sometimes it is possible to detect injury to vitality from outward appearance but usually this is unreliable. The vitality of seed corn should be determined by a germination test before planting.

Germination tests were made with all the samples collected. In the summary presented below a separation is made of the corn purchased on the ear and that shelled. It will be noted that the total number of samples tested is considerably higher than the total of the lots shelled and on the ear. This is accounted for by the fact that

SUMMARY AND CONCLUSIONS

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The following table contains a list of the varieties which were reported more than five times. It will be noted that the total is considerably higher than the number of lots reported under other headings. This is because in many cases two and sometimes more varieties were being used by one farmer.

Varieties.	Total.	Ontario.				Quebec.
		Dist. 1.	Dist. 2.	Dist. 3.	Dist. 4.	
Number varieties reported.....	2,346	219	803	1,000	13	100
White Cap Yellow Dent.....	500	77	212	254	.....	17
Leaming.....	487	43	186	226	.....	32
Longfellow.....	288	8	64	155	4	57
Compton's Early.....	217	5	93	107	.....	12
Wisconsin No. 7.....	.....	27	113	53	1	10
Mammoth Southern Sweet.....	18	14	30	90	.....	7
Salzer's North Dakota.....	121	3	32	80	5	1
Red Cob.....	50	.....	2	30	.....	27
King Philip.....	43	.....	15	27	.....	1
Bailey.....	32	4	28	.....	.....	.....
White Sanford.....	18	.....	1	.....	.....	.....
Eight-rowed Yellow.....	17	.....	2	15	.....	17
Stowell's Evergreen.....	17	4	9	3	.....	.....
Cloud's Early Yellow.....	15	4	8	2	.....	1
Sweet Ensilage.....	13	.....	13	.....	.....	1
Golden Glow.....	10	.....	3	4	3	1
Huron Dent.....	9	5	3	.....	.....	1
Snut Nose.....	7	.....	3	4	.....	.....
Iowa Gold Mine.....	6	.....	3	.....	.....	.....
Pride of North.....	6	.....	5	1	.....	.....
Angel of Midnight.....	6	1	4	.....	.....	.....
Mammoth Cuban.....	6	.....	1	5	.....	1
Miscellaneous and mixed.....	89	24	28	24	1	12

SUMMARY AND CONCLUSIONS.

The quality of the grain grown and used for seed on the average farm in all the provinces is rather inferior to the ideals expressed in resolutions sometimes adopted by farmers' organizations and addressed to Ministers of Agriculture, praying for legislation to prevent the sale of impure seed.

Although the average quality of seed grain in all the provinces is much inferior to that used by the most successful farmers, there is evidence of improvement in the last ten years.

Field crop competitions, seed fairs and provincial seed exhibitions have been influential in improving the quality of seed grain used in all the provinces. Twenty-five per cent of the farmers visited purchased their seed from their neighbours or from dealers. The seed so purchased may commonly be traced back to a prize-winning field in a field crop competition, the seed grain from which had been sold at a local seed fair. Competitors in these field crop competitions obtain pure seed from growers of registered seed whose foundation stock, as a rule, is the result of careful breeding and selection at an experiment station. The Marquis wheat and O. A. C. No. 21 barley are notable illustrations of improved varieties now widely disseminated.

Forty per cent of the farmers visited did not know the variety of their wheat, oats or barley. The best variety for any locality is second in importance only to the best seed of that variety. A suitable variety is important in any crop but particularly so with ensilage corn. Unfortunately there are too many varieties, particularly of oats.

The conditions in respect to the poor cleaning which seed grain receives and the numbers of weed seeds which are returned to the land are most unfortunate and must result in enormously reducing the yield and in lowering the quality of the crops. In many cases the equipment which farmers have at their disposal is not efficient for cleaning seed grain. Few fanning-mills are properly equipped with riddles and screens for seed cleaning and often the sieves and other equipment in farmers' barns are badly in need of repair. There is also room for the exercise of greater skill in the use of the cleaning equipment now available.

Crop failure due to unwitting use of seed of low vitality is comparatively rare. It was quite common ten years ago, especially with ensilage corn in eastern Canada and with oats and barley in the Prairie Provinces and Quebec. Although more precautions are taken than formerly, the vitality was low in a considerable proportion of the sample collected. With oats, barley and corn it is impossible accurately to estimate by appearance the extent to which the vitality may have been injured through frost and other causes. Many poor crops could be prevented by submitting the seed to a germination test.

The control of smut in cereal crops, particularly in wheat, is well understood and widely practised in Prairie Provinces. In the eastern provinces very little seed grain is treated and smut causes serious preventable loss, especially in the oat crop.

The Seed Control Act has prevented misrepresentation in the sale of seed grain. It has not created and can not create a reasonably clean supply suitable for seed. Some good seed is made available by seedsmen, but the great bulk of the grain purchased in commerce and used for seed is of the standard commercial grades, the cleanest of which may contain up to 150 noxious weed seeds per pound. In grading and handling Western grain no provision is made for keeping that which is clean separate from that which is badly contaminated with weed seeds with the result that practically none of the grain which passes through the terminal elevators is fit for seed.

It is impossible effectively to remedy by legislation the conditions shown to exist by this inquiry. Making and enforcing laws respecting the sale of seed and control of weeds may contribute materially toward the desired end, but success by these agencies will be only partial and always dependent upon educational work and the extent to which the means for securing and preparing good seed are available to and made use of by farmers.

